Virginia Gardening
with Jim May
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Leaves play critical role even after fall colors fade

By Jim May

Leaves are amazing things and right now they are playing a very prominent role in the landscape. Leaves give trees both life and character. That character is never more evident than during the month of October when the colors of autumn peak. Their role the rest of the year is critical, just not quite as flashy.

Leaves function not only as solar collectors but as food factories. Through the process of photosynthesis, leaves use carbon dioxide, water and sunlight to produce life-sustaining carbohydrates. These sugars are transported through the phloem down into the roots where they are stored as food. This food is then transported as needed by the tree. When “the sap is rising” in late winter and early spring, trees are moving sugars to get ready for another season of leaf production.

Leaves are recyclers as well. The water they use during photosynthesis is recycled as water vapor and released through millions of microscopic openings on the undersides of leaves called stomates. The carbon dioxide we release as a waste gas from breathing and burning fossil fuels passes through these stomata and is turned into oxygen by leaves, the purest form of recycling I know.

Leaves also act as nature’s air conditioners. Think about sitting in the shade of a huge oak tree on a hot summer day. As thousands of gallons of water are transported from the roots, through the tree and out the stomates of the leaves as water vapor, we benefit from the cooling effects.

Most leaves develop a large flattened surface called the leaf blade. They come in many shapes and sizes and are used as a primary identification feature of trees. Leaves are attached to the stem of the tree by strong, flexible stalks called petioles. This flexibility allows leaves to move freely, fluttering in the breeze. This feature not only reduces wind resistance, but also lets the leaves receive the most sunlight.

Both the top and bottom surface of the leaf blade is called the epidermis and it may be smooth, waxy or covered with tiny hairs. A protective layer of a waxy substance called cutin on the surface protects the leaf from dehydration and helps repel insects and disease. Cutin builds up as spring progresses and protects the leaves from increased sunlight in the hot summer months. Cutin is thicker on some evergreen trees that grow in warm areas such as southern magnolias, and thinner on cooler-climate deciduous trees like birches.

On the underside of leaves, the stomata are busy opening and closing their guard cells to regulate transpiration, the passage of water vapor, oxygen and carbon dioxide in and out of the leaf. These guard cells open in response to environmental conditions and heat, dry weather and nightfall close the guard cells to prevent too much moisture being lost.

The cells of a leaf contain millions of chloroplasts that not only function in photosynthesis but also give leaves their characteristic green color. This time of year as day length shortens and temperatures cool, leaves stop producing chlorophyll. The green fades and the other pigments that were there all year, show themselves.

The intense yellows of hickories, birches, ginkgos and tulip poplars are due to the presence of xanthophyll, a yellow-to-gold pigment present in the leaf throughout the growing season, but masked by the chlorophyll. The oranges of sugar maples are the result of carotenes and xanthophylls.

The pigments responsible for the vivid red and purple autumn colors of persimmons, dogwoods, red maples, sumacs, sweetgums and ashes come from another group of cell pigments called anthocyanins. Anthocyanins develop in leaf cells in late summer as chlorophyll production slows.

As we watch the leaves change to beautiful colors and fall this time of year, we can rest assured that they have done their job. They cooled us all summer, filtered our air, provided us oxygen, reduced dust and noise, made our world beautifully green for a few months and manufactured food for the tree so it could do it all again next year. That’s no small feat. It’s no wonder they need to take a well-deserved rest in the winter.

Virginia Gardening with Jim May is brought to you by the Virginia Green Industry Council and the Virginia Department of Agriculture and Consumer Services.